FREED TYPE 1020-B

MEGOHMMETER

INSTRUCTION MANUAL

FREED TRANSFORMER CO., INC.

1718 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N. Y.

FREED TYPE 1020-B
MEGOHMMETER

MEGOHMS
WESTON
500V.
X
GND.
GUARD
FUSE
10 MEG
1 MEG
CALIBRATION
ZERO ADJ.
100 MEG
1 K MEG
10 K MEG
100 K MEG
MEGOHMMETER
TYPE 1020-B
FREED TRANSFORMER CO.
BROOKLYN, N. Y., U. S. A.
PRESS

OPERATING INSTRUCTIONS

FOR

FREED TYPE 1020-B MEGOHMMETER

DESCRIPTION:

The instrument is a direct reading precision balanced electronic ohmmeter with a 500 volt d-c test potential included as a part of the unit. The insulation resistance is measured in six overlapping ranges and is indicated by a four inch meter, protected against overload. A relay, operated from the front panel disconnects the high voltage from the test terminals and eliminates all danger of shock due to exposed high potential. In the stand-by position (when push-button is released) a resistance between the high voltage terminal and chassis (ground) discharges the condenser under test, eliminating danger of shock when disconnecting the component.

SPECIFICATIONS

RANGE:

1 megohm to 2,000,000 megohms in six overlapping ranges selected by a multiplier switch.

SCALE:

Resistance is indicated on easy to read four inch meter which is protected against overload.

ACCURACY:

Plus or minus 3% on resistance values up to 100,000 megohms; plus or minus 5% from 100,000 to 2,000,000 megohms.

VOLTAGES ON UNKNOWN:

The voltage applied to the unknown terminals is 500 volts d-c and is independent, (less than 1%) of the value of the unknown.

STABILITY:

Line voltage variations from 105-125 volts will cause less than 2% variation in the meter reading.

TERMINALS:

Four terminals are provided, two for connecting the unknown, one guard and one ground. As a safety feature, when pushbutton is released, the test voltage is removed from the terminals. This permits connections to be made without danger of shock in all positions of the selector switch.

CONTROLS:

1. Range Selector and Calibrating Switch.
2. Zero Adjust Control for setting meter scale to infinity.
3. Pushbutton Switch for activating the relay which applies test voltage to terminals—when released, discharges capacitive component across the unknown terminals.
4. A.C. On-off Switch.

TUBES:

1 --- 6C4	1 --- 2X2-A
1 --- 6AU6	1 --- 6X4
1 --- 12AU7	1 --- OB2

1 --- 5651

POWER SUPPLY:

105-125 volts A.C. 50-60 cycles 30 watts.

CABINET:

Portable and of all metal construction.

DIMENSIONS:

9½ x 10½ x 8 inches.

NET WEIGHT:

18 pounds.

ACCESSORIES SUPPLIED:

Test leads with interchangeable tips consisting of color coded test prods and alligator clips.

OPERATING PROCEDURE

Turn power switch to the "ON" position. Allow a five minute warmup period. Rotate the range selector switch to the "ZERO ADJUST" position, press the push button and set panel meter to infinity, using the "ZERO ADJUST" control. Turn range selector switch to "CALIBRATION" position, then press push button. The meter should indicate 500 volts. Normally no adjustment should be necessary.

The instrument may now be used without further adjustment of the "ZERO ADJUST" except when one of the last two ranges (10 K and 100 K MEG) is used. When using one of these higher ranges the following procedure should be used: Check the infinity reading of the meter with no leads connected to the terminals. A slight readjustment of the "ZERO ADJUST" may be necessary. Connect the test leads provided with the instrument to the "X" terminals. These are low leakage leads and no attempt should be made to correct this slight lead leakage by readjusting the "ZERO ADJUST."

In some instances it may be necessary to use shielded test leads. Using shielded test leads with their shields connected to the "GUARD" terminal (and using connections shown in figure 2) prevents any leakage through the lead insulating material from being measured.

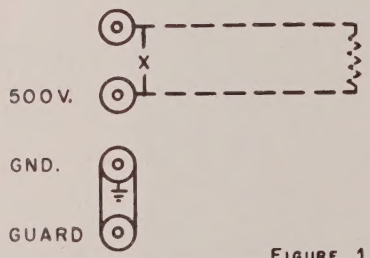


FIGURE 1

To measure the leakage resistance of insulating materials, condensers, cables, motors or transformer windings, make terminal connections as shown in figure 1. The "GUARD" is connected to the "GROUND" terminal and the unknown is connected across the "X" terminals. The value of the unknown is the meter reading multiplied by the setting of the range selector switch. It should be noted that the megohmmeter measures whatever resistance is connected between the "X" terminals. This may include series or parallel leakage paths through insulation or over its surface.

The leakage resistance of capacitors is measured in exactly the same manner as the resistance of other insulating materials, except that because of the time constants involved some precautions must be taken. To assure a rapid rate of charge when testing condensers, turn the range selector switch to the "1 MEG" position and press the test button. With the button held in this position, increase setting of the range selector switch until the condenser is fully charged. This is indicated when the meter pointer comes to rest.

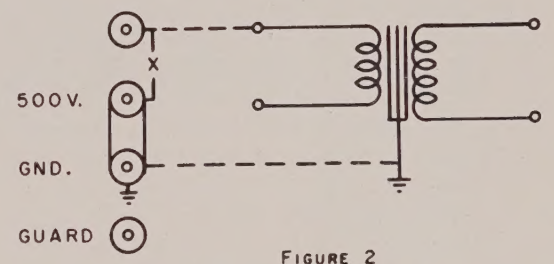


FIGURE 2

The instrument has been designed to measure leakage resistance of grounded core transformers. For terminal connections see figure 2. The "GROUND" terminal is now strapped to the "500 VOLT" terminal and the transformer connected as shown. This protects the operator from shock since the chassis of megohmmeter and the ground of the unit under test are at the same potential.

"USE OF THE GUARD TERMINAL"

The purpose of the "GUARD" terminal is to provide facilities for making three terminal network measurements. A typical application is the measurement of leakage resistance between two conductors of a multiconductor cable, where a three terminal network is formed as shown in figure 3.

The "GUARD" terminal is connected to terminal 3 of the network, the "GROUND" terminal to terminal 2 of the network and the low terminal to terminal 1 of the network. This will give the correct value of r12

provided r23 and r13 are not too low in value. Since r23 is directly across the 500 volt supply it should be 1 Meg or higher and r13 which is connected across the range resistor should be at least 100 times the value of the range resistor for 1% accuracy. Note that the "500 VOLT" terminal of the megohmmeter is connected to the "GROUND" terminal.

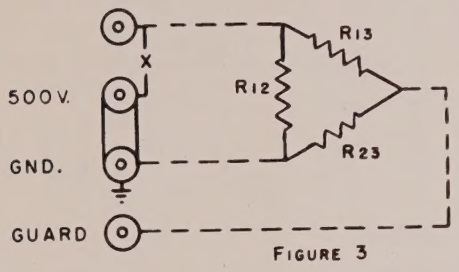


FIGURE 3

R12 IS LEAKAGE BETWEEN CONDUCTORS "A" AND "B"

R13 IS LEAKAGE BETWEEN "A" AND OTHER CONDUCTORS

R23 IS LEAKAGE BETWEEN "B" AND OTHER CONDUCTORS

Another application of a three terminal network is shown in figure 4 where it is desired to measure the resistance between windings of a transformer, or winding and core accurately.

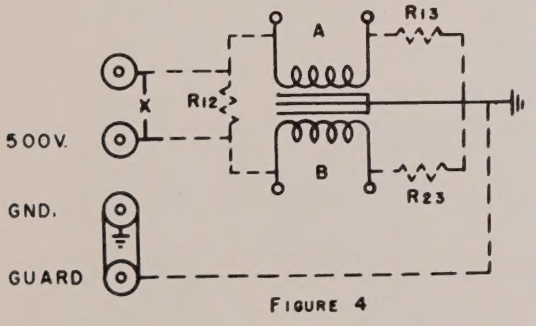


FIGURE 4

R12 IS LEAKAGE BETWEEN WINDINGS "A" AND "B"

R13 IS LEAKAGE BETWEEN "A" AND CORE

R23 IS LEAKAGE BETWEEN "B" AND CORE

"SERVICING"

It is not recommended to service this instrument except for tube replacement and adjustments.

"COARSE ZERO ADJUST"

This control (R11) is mounted on the side of the 12AU7 chassis and is in parallel with the "ZERO ADJUST" control on the front panel. Adjustment of this control is only necessary when the 12AU7 is replaced or when due to aging the tube requires rebalancing. To adjust: Allow the instrument to warm up for 10–15 minutes, set the front panel "ZERO ADJUST" control to the mid-position, set range selector switch to "ZERO ADJUST," press the test button and turn the "COARSE ZERO ADJUST" (R11) until the meter indicates a reading of infinity. Note: Due to a wide variation in the plate current balance of some 12AU7 tubes it may be necessary to try several tubes for this position.

"500 VOLT AND SCALE ADJUST"

These controls are provided to recalibrate the instrument if tube replacement is necessary. After the zero adjustment has been completed as outlined above turn the range selector switch to the "CALIBRATION" position. In this position a precision resistor (R9) is connected across the "X" terminals in series with the range resistor (R7). The ratio of these resistors is 2000 to 1 so that the total supply voltage of 500 volts is across the "X" terminals, and a meter indication of 2 should be seen. A reading other than 2 indicates that the 500 volt adjustment or full scale adjustment of the instrument has to be made. Connect a D.C. voltmeter of known accuracy and having an impedance greater than 750,000 ohms across the "X" terminals and adjusts the "500 VOLT ADJUST" (R21) until the standard meter indicates a reading of 500 volts. Then adjust the "FULL SCALE ADJUST" (R14) of instrument until the megohmmeter indicates a reading of 2. Recheck the "ZERO ADJUST."

PARTS LIST FOR 1020-B MEGOHMMETER

TRANSFORMERS

T1	Freed #24038	Power Transformer
T2	Freed #24039	Power Transformer

CONDENSERS

C1	.25 mfd	1000V	Bathtub
C2-3	10-10 mfd	450V	Electrolytic
C4	.1 mfd	200V	Paper

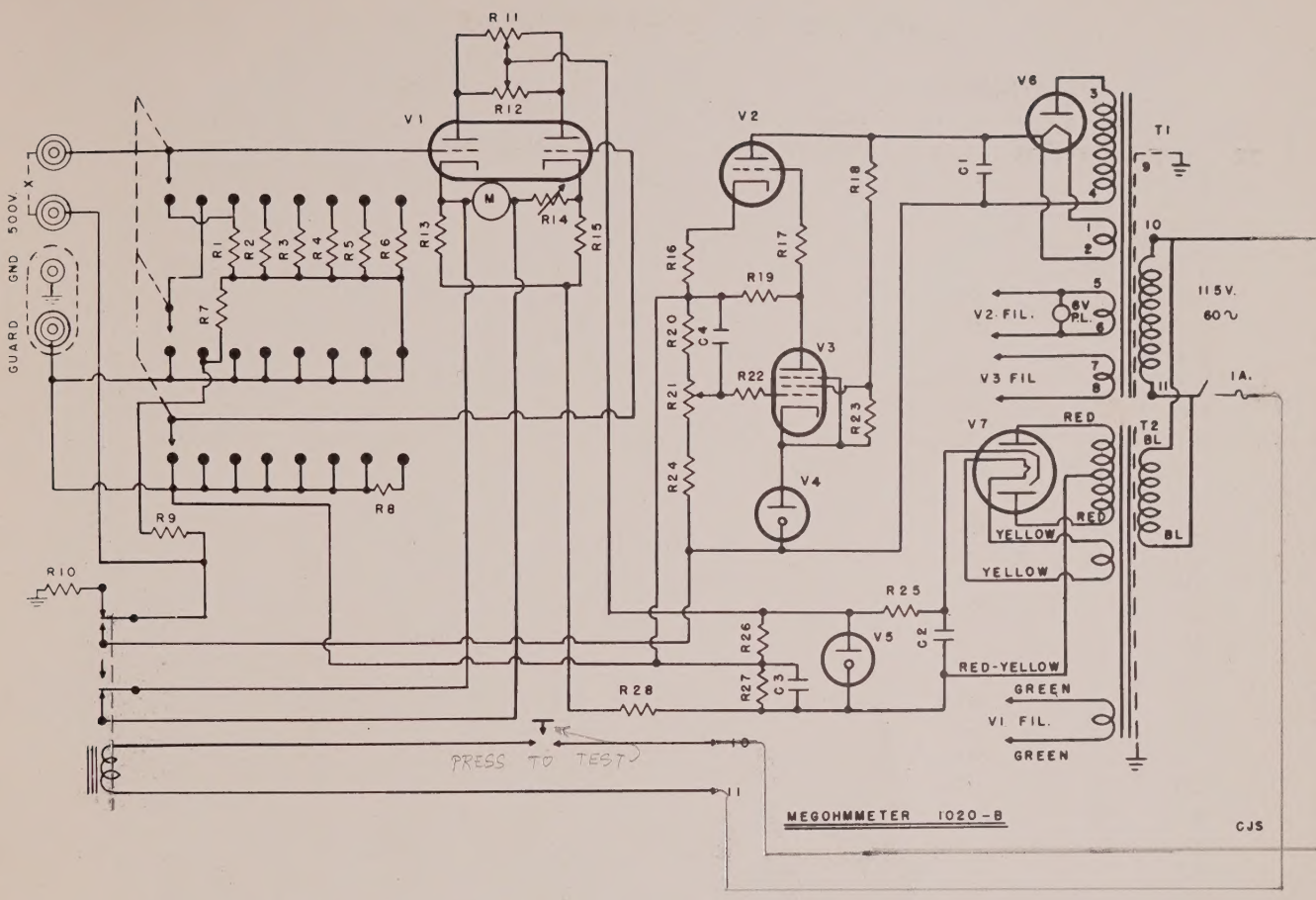
RESISTORS

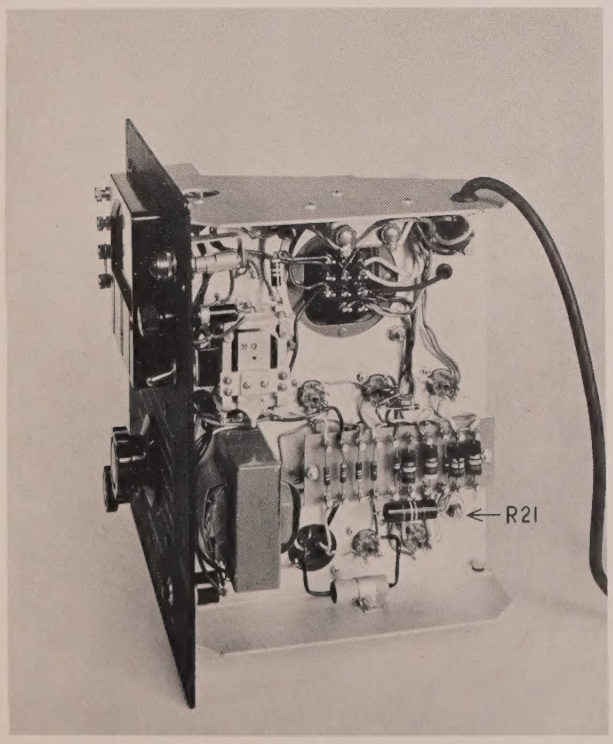
R 1	1K	1w	1%
R 2	10K	1w	1%
R 3	100K	1w	1%
R 4	1 meg	1w	1%
R 5	10 meg	1w	1%
R 6	100 meg	2w	1%
R 7	500 ohm	1w	1%
R 8	100 meg	2w	1%
R 9	1 meg	1w	1%
R10	470K	1w	10%
R11	10K	zero adjust potentionmeter	
R12	5K	zero adjust potentionmeter	
R13	10K	1/2w	1%
R14	2.5K	scale adjust potentionmeter	
R15	10K	1/2w	1%
R16	7.5K	1/2w	5%
R17	100K	1/2w	10%
R18	340K	4w	10%
R19	100K	1/2w	10%
R20	510K	2w	5%
R21	20K	500 volt adjust potentionmeter	
R22	1 meg	1/2w	10%
R23	82K	1/2w	10%
R24	91K	2w	5%
R25	4K	5w	5%
R26	47K	1/2w	10%
R27	47K	1/2w	10%
R28	22K	1/2w	10%

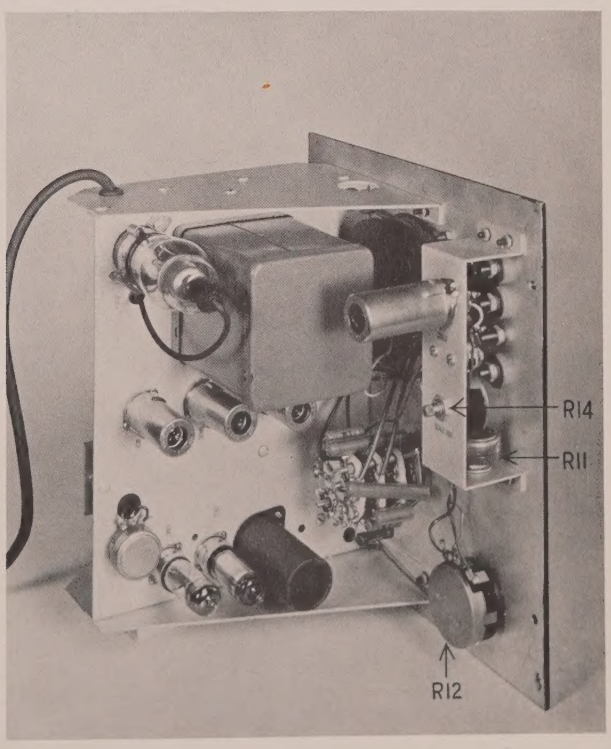
TABLE OF VOLTAGE READINGS

TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1 12AU7	50	0	3.4	Heater	Heater	50	0	3.4	Heater
V2 6C4	460	0	Heater	Heater	460	−25	8		
V3 6AU6	−360	−390	Heater	Heater	−25	−42	−390		
V4 5651	−390			−500					
V5 OB2	55	−50		−50	55		−50		
V6 2X2A	460			460					
V7 6X4	85AC		Heater	Heater		85AC	110		

All D.C. voltages measured to ground with 20,000 ohm/volt meter.
All A.C. voltages measured to ground with 1,000 ohm/volt meter.


R11
R12
V1
V2
V6
T1
GUARD
GND
500V
X
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R13
M
R14
R15
R16
R17
R18
C1
R19
R20
C4
R21
R22
V3
R23
R24
V4
V5
R25
R26
C2
C3
R27
R28
PRESS TO TEST
V2 FIL.
6V
PL.
V3 FIL
V7
RED
YELLOW
RED-YELLOW
GREEN
V1 FIL.
GREEN
T2
BL
115V.
60~
1A.
MEGOHMMETER 1020-B
CJS


R21


R14
R11
R12

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